Industry Oriented Project Final Report

Department of Electrical Engineering

2019-2020

Title: Eye Controlled Wheelchair

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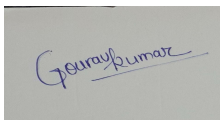

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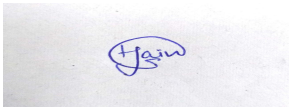

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1. Abstract

The idea is to use the pupil's motion of the person's eye sitting on the wheelchair to allow him to move in a desired direction. The system is cost effective and thus can be used by patients spread over a large economy range.

2. Introduction

People who have lost the control of their muscles cannot operate a wheelchair on their own.

Traditional wheelchairs either make them dependent on another person or they are too difficult to operate by themselves. An individual might be partially paralyzed and hence would always require an external help to move.

Eye Controlled Wheelchair is an idea that might solve the issue. It functions as a normal wheelchair but it eliminates the dependency of the user on external help. The idea is to control the movement of the wheelchair with the motion of the pupil. The direction in which a person looks is detected by a camera mounted on the wheelchair. The camera sends the signals to a microprocessor and it sends signal to the wheels and the wheels move in the desired direction. The idea is cost effective and can be possessed by anyone in need of the product.

This is a powerful idea that combines the technologies of Artificial Intelligence and Robotics in the Health Care sector.

3. Theory

Detecting facial landmarks is a subset of the shape detection problem. Given an input image (and normally an ROI that specifies the object of interest), a shape predictor attempts to localize key points of interest along the shape. In the context of facial landmarks, our goal is to detect important facial structures on the face using shape prediction methods.

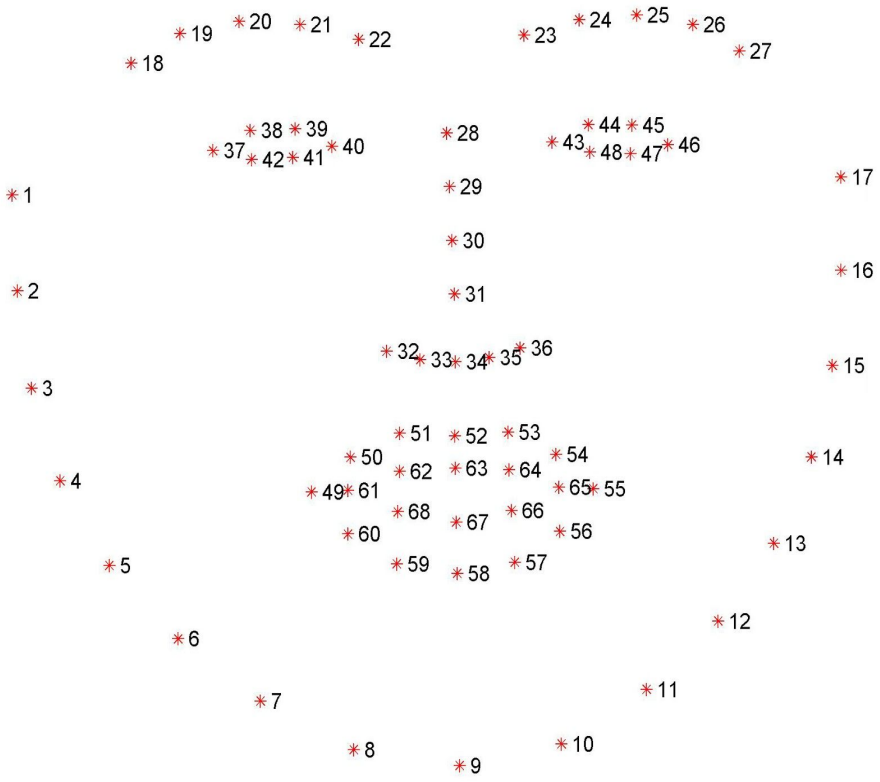

Figure 1: Facial landmarks using DLIB predictor and OpenCV

From figure 1, for the detection of eyes we choose following points:

- Left Eye: (37, 38, 39, 40, 41, 42)
- Right Eye: (43, 44, 45, 46, 47, 48)

Detecting facial landmarks is a two step process

- Localize the face in the image
- Detect the key facial structures on the face ROI.

4. Motivation

Locomotion is important for keeping up with the pace of life. There are many people who are unable to move from one place to another on their own because of physical disability.

Our project is an attempt to make the lives of the people suffering from diseases like motor-neuron disability simple and self-reliant.

5. Objectives

The objective is to control the movement of the wheelchair with the motion of the pupil. The direction in which a person looks is detected by a camera mounted on the wheelchair. Camera takes frames of eye positions and then processing on the frame done based on the eye position(center, left, right) and returns the result. We also set a Boolean to start or stop the Wheelchair. The person has to close his eyes for 5 seconds for either action. The action is then being sent to the NodeMCU by a (int) variable wirelessly. NodeMCU processes the instruction(center, left, right, start, stop) and gives power to the wheels according to the instruction.

6. Results

The system functions with an accuracy rate of 70–90 % which is quite satisfactory. The image capture, eye movement detection and the algorithm for validating movement attempts perform very reliably as our results suggest.

7. Discussions

Following limitations need to be addressed

a) The face of the user should be well-illuminated.
b) The head of the person should be steady when frames were captured for precise detection.
c) The camera should be at a specific distance from the user and the background should not have any other faces.
d) The accuracy can be increased using more sophisticated models.

Future Scope

a) Cursor Tracking for PCs
b) Completely Paralyzed people can use their eyeball motion for indicating ‘YES/NO’.

8. Conclusions

Quadriplegia is paralysis caused by illness or injury to the humans that results in partial or complete loss of limbs and torso. It's a phenomenon which confines the ability of a person to move by himself, and he has to rely on someone to carry him around.
We wanted to utilize the opportunity to design something which could be a contribution in our own small way to the society.

9. References

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